

Genetics Problem Sets solutions.

Set 1

$$1. \begin{array}{c} A \ A \\ a | Aa \ Aa \\ a | Aa \ Aa \end{array} ; \begin{array}{c} B \ b \\ b | Bb \ bb \\ b | Bb \ bb \end{array} ; \begin{array}{c} C \ C \\ c | Cc \ Cc \\ c | Cc \ Cc \end{array} ; \begin{array}{c} D \ d \\ d | Dd \ dd \\ d | Dd \ dd \end{array} ; \begin{array}{c} e \ e \\ e | ee \ ee \\ e | ee \ ee \end{array}$$

$$2. \begin{array}{l} a) \begin{array}{c} B \ B \\ b | Bb \ Bb \\ b | Bb \ Bb \end{array} \\ G: 100\% Bb \\ P: 100\% \text{ black} \end{array} \quad \begin{array}{l} b) \begin{array}{c} B \ b \\ b | BB \ Bb \\ b | Bb \ bb \end{array} \\ G: 1 BB : 2 Bb : 1 bb \\ P: 3 \text{ black} : 1 \text{ white} \end{array} \quad \begin{array}{l} c) \begin{array}{c} B \ b \\ b | Bb \ bb \\ b | Bb \ bb \end{array} \\ G: 1 Bb : 1 bb \\ P: 1 \text{ black} : 1 \text{ white} \end{array}$$

$$3. \begin{array}{l} a) 100\% \text{ hornless offspring (Hh)} \\ b) Hh \times Hh \rightarrow 75\% \text{ chance of hornless ; } 25\% \text{ horned} \end{array}$$

$$\begin{array}{c} H \ h \\ H | HH \ Hh \\ h | Hh \ (hh) - \text{horned!} \end{array}$$

Set 2

L = long wing, l = short \rightarrow G = grey, g = ebony

$$4. \begin{array}{c} ll \ gg \\ g | lg \\ g | lg \end{array} \times \begin{array}{c} LL \ GG \\ L \ L \\ G | LG \\ G | LG \end{array} \rightarrow \begin{array}{c} LG \\ lg | LgGg = F_1 \end{array}$$

$$F_1 \text{ cross} = LlGg \times LlGg$$

$$\begin{array}{c} L \ l \\ G | LG \ lg \\ g | Lg \ lg \end{array} \quad \begin{array}{c} L \ l \\ G | LG \ lg \\ g | Lg \ lg \end{array}$$

$$\begin{array}{c} LG \ lg \ Lg \ lg \\ LG | LLGG \ LlGG \ LLGg \ LlGg \\ Lg | LLGg \ LlGg \ LLgg \ Llgg \\ lg | LlGG \ llGG \ LlGg \ llGg \\ lg | LlGg \ llGg \ Llgg \ llgg \end{array}$$

long, grey - 9
short grey - 3
long ebony - 3
short eb - 1

5. $BBtt \times bbTT \rightarrow$ parent gen

$BbTt \rightarrow F_1$

$BbTt \times BbTt$

$$\begin{array}{c} B \quad b \\ T \quad \hline BT \quad bT \\ t \quad \hline Bt \quad bt \end{array}$$

$$\begin{array}{c} B \quad b \\ T \quad \hline BT \quad bT \\ t \quad \hline Bt \quad bt \end{array}$$

	BT	bT	Bt	bt
BT	BBTT	BbTT	BBTt	BbTt
bT	BbTT	bbTT	BbTt	bbTt
Bt	BBTt	BbTt	BBtt	Bbtt
bt	BbTt	bbTt	Bbtt	bbtt

9:3:3:1 phenotype ratio.

6. $Ccnn \times ccNn$

$$\begin{array}{c} C \quad c \\ n \quad \hline Cn \quad cn \\ n \quad \hline \end{array}$$

$$\begin{array}{c} C \quad c \\ N \quad \hline cN \quad cn \\ n \quad \hline \end{array}$$

* I shortened it b/c I am lazy :)

$$\begin{array}{c} Cn \quad cn \\ cN \quad \hline CcNn \quad ccNn \\ cn \quad \hline Ccnn \quad ccnn \end{array} \rightarrow \text{Kid.}$$

Set 3

7. $H^F H^F \times H^N H^N$ - Parent gen

$$\begin{array}{c} H^F \quad H^F \\ H^N \quad \hline H^F H^N \\ H^N \quad \hline \end{array} \rightarrow F_1$$

$\rightarrow H^F H^N \times H^F H^N$

$$\begin{array}{c} H^F \quad H^N \\ H^F \quad \hline H^F H^F \quad H^F H^N \\ H^N \quad \hline H^F H^N \quad H^N H^N \end{array} \} F_2 \text{ gen}$$

$$8. F_T^R F_T^W \times F_t^R F_t^W$$

a)

	F_T^R	F_T^W
F_t^R	$F_T^R F_t^R$	$F_T^R F_t^W$
F_t^W	$F_T^R F_t^W$	$F_T^W F_t^W$

b) - Should mate to produce pink flowers
 $F^R F^R \times F^W F^W$
 = all $F^R F^W$ } Pink.

Set 4

$$9. C^R C^R \times C^W C^W - \text{Par gen}$$

	C^R	C^R
C^W	$C^R C^W$	$C^R C^W$
C^W	$C^R C^W$	$C^R C^W$

F_1 gen all roan

$$C^R C^W \times C^R C^W - F_1 \text{ cross}$$

	C^R	C^W
C^R	$C^R C^R$	$C^R C^W$
C^W	$C^R C^W$	$C^W C^W$

red: 2 roan: 1 white
 F_2 gen.

Set 5

$$10. I^A I^B \times ii$$

	I^A	I^B
i	$I^A i$	$I^B i$
i	$I^A i$	$I^B i$

- Son would have to be type A or B blood!

$$11. B_1 - ii \quad B_2 = I^A$$

Brown: $I^B i$ or $I^B I^B \times I^A I^B = I^A i = \text{Babe 2}$

Smith: $I^B i$ or $I^B I^B \times I^B i$ or $I^B I^B = ii = \text{babe 1}$

Set 6

12. a). $X^1Y \times XX$

$$\begin{array}{c} X^1Y \\ X \overline{X^1X \quad XY} \\ X \overline{X^1X \quad XY} \end{array}$$

carrier girl: 1
norm man: 1

b) X^1X^1

$$\begin{array}{c} X^1X^1 \\ X \overline{X^1X \quad X^1X} \\ Y \overline{X^1Y \quad X^1Y} \end{array}$$

Carrier girl: 1
blind man: 1

c) X^1X

$$\begin{array}{c} X^1X \\ X \overline{X^1X \quad XX} \\ Y \overline{X^1Y \quad XY} \end{array}$$

carrier girl: 1
norm girl: 1
blind boy: 1
norm boy: 1

13. X^1X - mom
 XY - dad

$$\begin{array}{c} X^1X \\ X \overline{X^1X \quad XX} \\ Y \overline{X^1Y \quad XY} \end{array}$$

she has a 50% chance of being a carrier so...

option 1

$$\begin{array}{c} X^1X \\ X \overline{X^1X \quad XX} \\ Y \overline{X^1Y \quad XY} \end{array}$$

or

$$\begin{array}{c} XX \\ X \overline{XX \quad XX} \\ Y \overline{XY \quad XY} \end{array}$$

14. a) $X^B X^B \times X^Y Y \rightarrow$

$$\begin{array}{c} X^Y Y \\ X^B \overline{X^B X^Y \quad X^B Y} \\ X^B \overline{X^B X^Y \quad X^B Y} \end{array}$$

- black male
or
tortoise female.

b) $X^B X^Y \times X^B Y$

$$\begin{array}{c} X^B X^Y \\ X^B \overline{X^B X^B \quad X^B X^Y} \\ Y \overline{X^B Y \quad X^Y Y} \end{array}$$

black fem - 1
tort fem - 1
black male - 1
yellow male - 1

c) tortoise shell is sterile b/c it can't be carried on ~~Y~~ chromosome so it was likely non disjunction \therefore making it sterile.

15. george: Aa

Arlene: aa

Sandra: AA or Aa

Tom : aa

Sam: Aa

Wilma: aa

Ann: Aa

michael: Aa

Daniel: Aa

Alan: Aa

Tina: AA or Aa

Carla: aa

Christopher: AA or Aa.